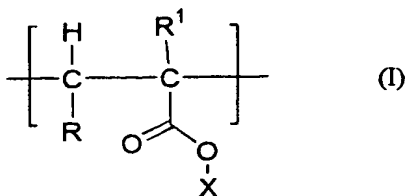


## CLAIMS

1. A polymer comprising the unit (I)



10 wherein R is selected from the group consisting of hydrogen, C<sub>1</sub>-C<sub>18</sub> alkyl, C<sub>1</sub>-C<sub>18</sub> alkenyl, C<sub>1</sub>-C<sub>18</sub> aralkyl, C<sub>1</sub>-C<sub>18</sub> alkaryl, carboxylic acid, carboxy-C<sub>1</sub>-  
alkyl, or any one of C<sub>1</sub>-C<sub>18</sub> alkyl, C<sub>1</sub>-C<sub>18</sub> alkenyl, C<sub>1</sub>-C<sub>18</sub> aralkyl, C<sub>1</sub>-C<sub>18</sub> alkaryl substituted with a heteroatom within, or attached to, the carbon backbone; R<sup>1</sup>  
is selected from the group consisting of hydrogen, C<sub>1</sub>-C<sub>6</sub> alkyl groups; X is an acylating agent and wherein the polymer has a polydispersity of less than  
1.4, preferably less than 1.2 and a molecular weight (Mw) of less than  
15 100,000.

2. The polymer according to claim 1, wherein X is a carboxylate activating group, preferably selected from the group consisting of N-succinimidyl, pentachlorophenyl, pentafluorophenyl, para-nitrophenyl, dinitrophenyl, N-phthalimido, N-norbornyl, cyanomethyl, pyridyl,  
20 trichlorotriazine, 5-chloroquinilino, and imidazole, preferably N-succinimidyl or imidazole, most preferably N-succinimidyl.

3. The polymer according to claim 1 or claim 2, wherein R is selected from the group consisting of hydrogen, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>1</sub>-C<sub>6</sub> alkenyl, C<sub>1</sub>-C<sub>6</sub> aralkyl and C<sub>1</sub>-C<sub>6</sub> alkaryl, C<sub>1</sub>-C<sub>6</sub> alkylamido and C<sub>1</sub>-C<sub>6</sub> alkylimido, preferably hydrogen or methyl.  
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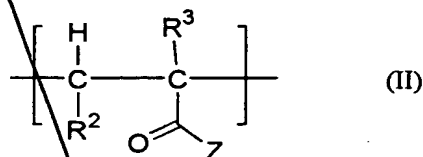
4. The polymer according to any preceding claim, wherein R<sup>1</sup> is hydrogen, methyl, ethyl, propyl, butyl, pentyl or isomers thereof, preferably hydrogen or methyl.

5. The polymer according to any preceding claim, wherein the  
30 molecular weight (Mw) is in the range 50,000-4000, preferably 25,000 - 40,000.

6. The polymer according to any preceding claim, wherein R is hydrogen, R<sup>1</sup> is methyl.

7. The polymer according to any preceding claim, wherein the polymer is a homopolymer.

8. A polymer according to any of claims 1 to 6 comprising the unit (II)



wherein R<sup>2</sup> is selected from hydrogen, C<sub>1</sub>-C<sub>18</sub> alkyl, C<sub>1</sub>-C<sub>18</sub> alkenyl, C<sub>1</sub>-C<sub>18</sub> aralkyl, C<sub>1</sub>-C<sub>18</sub> alkaryl, carboxylic acid and carboxy-C<sub>1-6</sub>alkyl; R<sup>3</sup> is selected from the group consisting of hydrogen, methyl, ethyl, propyl, butyl, pentyl and isomers thereof, Z is a pendent group selected from the group consisting of NR<sup>4</sup>R<sup>5</sup>, SR<sup>6</sup> and OR<sup>7</sup>, wherein R<sup>4</sup> is an acyl group, preferably an aminoacyl group or oligopeptidyl group; R<sup>5</sup> is selected from hydrogen, C<sub>1</sub>-C<sub>18</sub> alkyl, C<sub>1</sub>-C<sub>18</sub> alkenyl, C<sub>1</sub>-C<sub>18</sub> aralkyl, C<sub>1</sub>-C<sub>18</sub> alkaryl; R<sup>6</sup> and R<sup>7</sup> are selected from the group consisting of hydrogen, C<sub>1</sub>-C<sub>12</sub> alkyl, C<sub>1</sub>-C<sub>12</sub> alkenyl, C<sub>1</sub>-C<sub>12</sub> aralkyl, C<sub>1</sub>-C<sub>12</sub> alkaryl, C<sub>1</sub>-C<sub>12</sub> alkoxy and C<sub>1</sub>-C<sub>12</sub> hydroxyalkyl, and may contain one or more cleavable bonds and may be covalently linked to a bioactive agent.

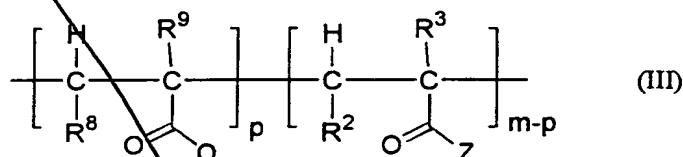
9. A polymer according to claim 8, wherein Z comprises one or more hydrolytically labile groups selected from cis-aconityl, and aminoacyl groups, preferably 2 to 6 aminoacyl groups, most preferably 4 aminoacyl groups.

10. A polymer according to claim 8 or 9 comprising the unit (II) wherein R<sup>2</sup> is hydrogen, C<sub>1</sub>-C<sub>18</sub> alkyl, C<sub>1</sub>-C<sub>18</sub> alkenyl, C<sub>1</sub>-C<sub>18</sub> aralkyl, C<sub>1</sub>-C<sub>18</sub> alkaryl, R<sup>3</sup> is selected from the group consisting of hydrogen, methyl, ethyl, propyl, butyl, pentyl and isomers thereof, Z is a pendent group NR<sup>4</sup>R<sup>5</sup>, wherein R<sup>4</sup> is an acyl group, preferably an aminoacyl group or oligopeptidyl group; R<sup>5</sup> is selected from hydrogen, C<sub>1</sub>-C<sub>8</sub> alkyl, C<sub>1</sub>-C<sub>12</sub> alkenyl, C<sub>1</sub>-C<sub>12</sub> aralkyl, C<sub>1</sub>-C<sub>12</sub> alkaryl; and wherein the polymer has a molecular weight (Mw) of less than 50,000.

11. A polymer according to claim 8 to 10 wherein (II) is linked to a bioactive agent and the bioactive agent is a drug.

12. A polymer according to claim 11 wherein the drug is an anti-cancer agent, preferably doxorubicin, daunomycin, or paclitaxel.

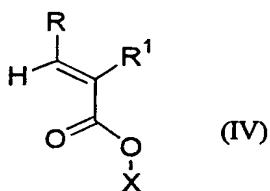
13. A polymer according to any of claims 8 to 12, wherein the polymer has the structure (III)



wherein  $\text{R}^8$  and  $\text{R}^9$  are selected from the same groups as  $\text{R}^2$  and  $\text{R}^3$  respectively, Q is a solubilising groups selected from the group consisting of  $\text{C}_1\text{-C}_{12}$  alkyl,  $\text{C}_1\text{-C}_{12}$  alkenyl,  $\text{C}_1\text{-C}_{12}$  aralkyl,  $\text{C}_1\text{-C}_{12}$  alkaryl,  $\text{C}_1\text{-C}_{12}$  alkoxy,  $\text{C}_1\text{-C}_{12}$  hydroxyalkyl,  $\text{C}_1\text{-C}_{12}$  alkylamido,  $\text{C}_1\text{-C}_{12}$  alkylimido,  $\text{C}_1\text{-C}_{12}$  alkanoyl, and wherein m and p are integers of less than 500.

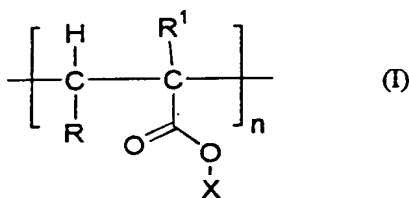
14. A polymer according to claim 13 wherein Q is a  $\text{C}_1\text{-C}_{12}$  hydroxyalkylamino group, preferably 2-hydroxypropylamino.

15. A process for the production of a polymer, comprising the radical polymerization of ethylenically unsaturated compounds comprising a compound (IV)



wherein R is selected from the group consisting of hydrogen,  $\text{C}_1\text{-C}_{18}$  alkyl,  $\text{C}_1\text{-C}_{18}$  alkenyl,  $\text{C}_1\text{-C}_{18}$  aralkyl,  $\text{C}_1\text{-C}_{18}$  alkaryl, carboxyl, carboxyalkyl, or any one of  $\text{C}_1\text{-C}_{18}$  alkyl,  $\text{C}_1\text{-C}_{18}$  alkenyl,  $\text{C}_1\text{-C}_{18}$  aralkyl,  $\text{C}_1\text{-C}_{18}$  alkaryl substituted with a heteroatom within, or attached to, the carbon backbone;  $\text{R}^1$  is selected from the group consisting of hydrogen and  $\text{C}_1\text{-C}_6$  alkyl groups preferably selected from the group consisting of methyl, ethyl, propyl, butyl, pentyl and isomers thereof; X is a carboxylate activating group; wherein the process is a

controlled radical polymerization, to produce a polymer comprising the unit  
(I)



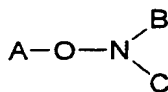
wherein n is an integer of 1 to 500.

16. A process according to claim 15, wherein the process is  
selected from the group consisting of Reversible Addition Chain Transfer  
Polymerization, Atom Transfer Radical Polymerization and Nitroxide  
Mediated Polymerization, preferably Atom Transfer Radical Polymerization.

17. The process according to claim 15 or 16, wherein the process  
additionally comprises a solvent, an Atom Transfer Radical Polymerization  
initiator selected from alkylhalides, preferably alkylbromides, and a mediator  
which comprises a Cu(I)Br moiety complexed by a chelating ligand,  
preferably the mediator being selected from Cu(I)Br(Bipy)<sub>2</sub>, Cu(I)Br(Bipy) N,  
Cu(I)Br(N, N', N'', N''-pentamethyldiethylenetriamine), Cu(I)Br[methyl<sub>6</sub> tris(2-  
aminoethyl)amine] and Cu(I)Br(pentamethyldiethylene).

18. The process according to claim 17, wherein the solvent is water  
or an aprotic solvent selected from the group consisting of tetrahydrofuran,  
acetonitrile, dimethylformamide, ethyl acetate, acetone, dimethylsulphoxide,  
methylformamide, sulfolane and mixtures thereof.

19. The process according to claim 16, wherein the polymerization  
is Nitroxide Mediate Polymerization that takes place in the presence of an  
initiator having the structure

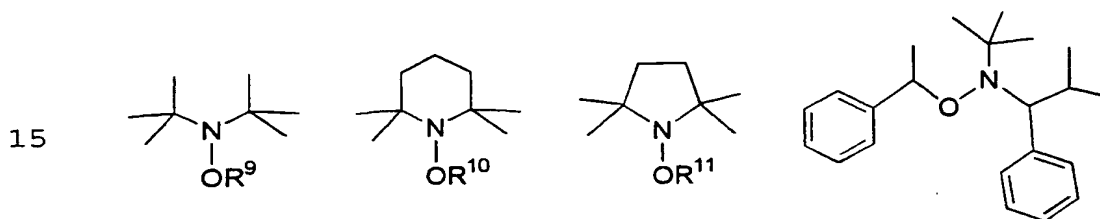


wherein A is selected from the group consisting of C<sub>1</sub>-C<sub>12</sub> alkyl, C<sub>1</sub>-C<sub>12</sub>  
alkenyl, C<sub>1</sub>-C<sub>12</sub> aralkyl, C<sub>1</sub>-C<sub>12</sub> alkaryl, C<sub>1</sub>-C<sub>12</sub> hydroxyalkyl, B and C are  
individually selected from the group consisting of C<sub>1</sub>-C<sub>12</sub> alkyl, C<sub>1</sub>-C<sub>12</sub> alkenyl,

C<sub>1</sub>-C<sub>12</sub> aralkyl, C<sub>1</sub>-C<sub>12</sub> alkaryl and C<sub>1</sub>-C<sub>12</sub> hydroxyalkyl, may be joined so that together with N form a C<sub>5</sub>-C<sub>12</sub> heterocyclic group, and which may contain one or more additional heteroatoms selected from nitrogen, sulfur, oxygen and phosphorus.

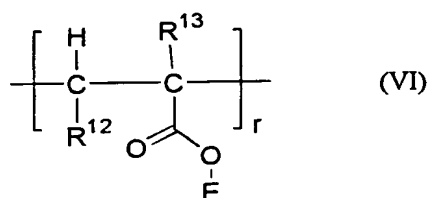
- 5           20. The process according to claim 19, wherein A is selected from the group consisting of methyl ethyl, propyl, butyl, pentyl, hexyl, benzyl, methylbenzene, ethyl benzene, propylbenzene or isomers thereof, and B and C are selected from the group consisting of isopropyl, isobutyl, secbutyl, tert-butyl, isopentyl, sec-pentyl, tert-pentyl, adamantyl, methylbenzene, ethyl
- 10 benzene, propylbenzene or isomers thereof.

21. The process according to claim 19 wherein the initiator has a structure selected from the group consisting of



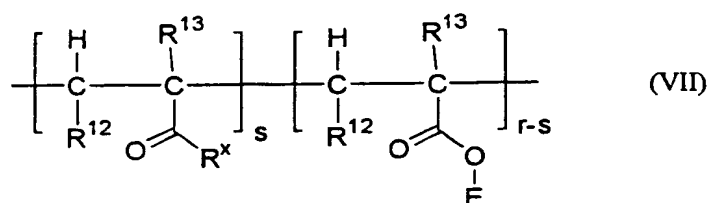
wherein R<sup>9</sup> to R<sup>11</sup> are selected from the group consisting of C<sub>1</sub>-C<sub>12</sub> alkyl, C<sub>1</sub>-C<sub>12</sub> alkenyl, C<sub>1</sub>-C<sub>12</sub> aralkyl and C<sub>1</sub>-C<sub>12</sub> alkaryl.

- 20           22. A process for the production of a derivitised polymer, comprising the reaction of a polymer having the formula (VI)



- wherein R<sup>12</sup> is a group selected from the group consisting of hydrogen, C<sub>1</sub>-C<sub>18</sub> alkyl, C<sub>1</sub>-C<sub>18</sub> alkenyl, C<sub>1</sub>-C<sub>18</sub> aralkyl and C<sub>1</sub>-C<sub>18</sub> alkaryl groups; R<sup>13</sup> is selected from the group consisting of C<sub>1</sub>-C<sub>6</sub> alkyl groups; E is a carboxylate activating group and r is an integer of 5 to 500; with a reagent HR<sup>x</sup>, wherein R<sup>x</sup> is selected from the group consisting of NR<sup>14</sup>R<sup>15</sup>, SR<sup>16</sup>, OR<sup>17</sup>, wherein R<sup>14</sup> is an acyl group, preferably an aminoacyl group or oligopeptidyl group; R<sup>15</sup> is
- 30

selected from hydrogen, C<sub>1</sub>-C<sub>18</sub> alkyl, C<sub>1</sub>-C<sub>18</sub> alkenyl, C<sub>1</sub>-C<sub>18</sub> aralkyl, C<sub>1</sub>-C<sub>18</sub> alkaryl; R<sup>16</sup> and R<sup>17</sup> are selected from the group consisting of hydrogen, C<sub>1</sub>-C<sub>12</sub> alkyl, C<sub>1</sub>-C<sub>12</sub> alkenyl, C<sub>1</sub>-C<sub>12</sub> aralkyl, C<sub>1</sub>-C<sub>12</sub> alkaryl, C<sub>1</sub>-C<sub>12</sub> alkoxy and C<sub>1</sub>-C<sub>12</sub> hydroxyalkyl, and may contain one or more cleavable bonds, to form a  
 5 derivatised polymer having the structure (VII)



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wherein  $1 \leq s \leq r$ .

23. A process according to claim 22 wherein R<sup>12</sup> selected from the group consisting of hydrogen, methyl, ethyl and propyl, R<sup>13</sup> is selected from the group consisting of hydrogen, methyl, ethyl and propyl and preferably R<sup>12</sup>  
 15 is hydrogen and R<sup>13</sup> is methyl.

24. A process according to claim 22 or 23, wherein E is selected from the group consisting of N-succinimidyl, pentachlorophenyl, pentafluorophenyl, para-nitrophenyl, dinitrophenyl, N-phthalimido, N-norbornyl, cyanomethyl, pyridyl, trichlorotriazine, 5-chloroquinilino, and imidazole, preferably N-succinimidyl or imidazole, most preferably N-succinimidyl.  
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25. A process according to claim 23, wherein the polymer of formula (VI) is a polymer of formula (I) according to any of claims 1 to 7.

26. A process according to any of claims 15 to 21, wherein the  
 25 polymer of the formula (I) is reacted in a second step with a reagent HR<sup>x</sup> as defined in claim 22, whereby at least some of the groups -OX are replaced by -R<sup>x</sup> in the product derivatised polymer.

27. A process according to any of claims 22 to 26, wherein HR<sup>x</sup> is H<sub>2</sub> NR<sup>14</sup> preferably NR<sup>14</sup> being an N-aminoacyl or N-oligopeptidyl group.

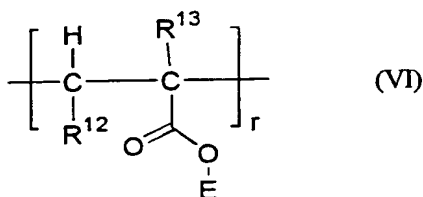
28. A process according to any of claims 22 to 27, wherein R<sup>x</sup>  
 30 comprises one or more aminoacyl groups, preferably 2 to 6, most preferably 4 aminoacyl groups.

29. A process according to any of claims 22 to 28 wherein R<sup>x</sup> comprises a bioactive agent, preferably an anti-cancer drug.

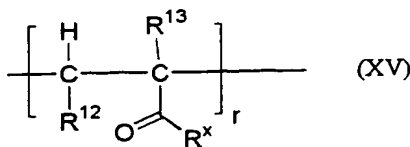
30. A process according to any of claims 22 to 29, comprising the additional step of reacting the unreacted groups, OE or OX groups, with a solubilising group selected from the group consisting of C<sub>1</sub>-C<sub>12</sub> alkyl, C<sub>1</sub>-C<sub>12</sub> alkenyl, C<sub>1</sub>-C<sub>12</sub> aralkyl, C<sub>1</sub>-C<sub>12</sub> alkaryl, C<sub>1</sub>-C<sub>12</sub> alkoxy, C<sub>1</sub>-C<sub>12</sub> hydroxyalkyl, C<sub>1</sub>-C<sub>12</sub> alkylamido, C<sub>1</sub>-C<sub>12</sub> alkylimido, C<sub>1</sub>-C<sub>12</sub> alkanoyl.

31. A process for the production of block copolymers comprising the steps of:

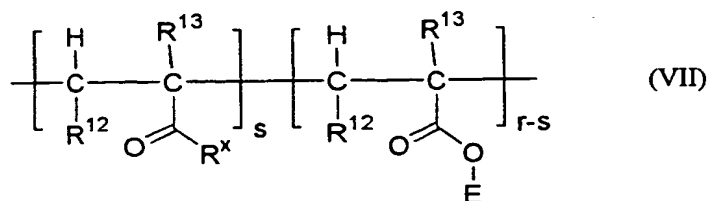
a. reacting a polymer having the formula (VI)



wherein R<sup>12</sup> is a group selected from the group consisting of hydrogen, C<sub>1</sub>-C<sub>18</sub> alkyl, C<sub>1</sub>-C<sub>18</sub> alkenyl, C<sub>1</sub>-C<sub>18</sub> aralkyl and C<sub>1</sub>-C<sub>18</sub> alkaryl groups; R<sup>13</sup> is selected from the group consisting of C<sub>1</sub>-C<sub>6</sub> alkyl groups; E is a carboxylate activating group and r is an integer of 5 to 500; with a reagent HR<sup>x</sup>, wherein R<sup>x</sup> is selected from the group consisting of NR<sup>14</sup>R<sup>15</sup>, SR<sup>16</sup>, OR<sup>17</sup>, wherein R<sup>14</sup> is an acyl group, preferably an aminoacyl group or oligopeptidyl group; R<sup>15</sup> is selected from hydrogen, C<sub>1</sub>-C<sub>18</sub> alkyl, C<sub>1</sub>-C<sub>18</sub> alkenyl, C<sub>1</sub>-C<sub>18</sub> aralkyl, C<sub>1</sub>-C<sub>18</sub> alkaryl; R<sup>16</sup> and R<sup>17</sup> are selected from the group consisting of hydrogen, C<sub>1</sub>-C<sub>12</sub> alkyl, C<sub>1</sub>-C<sub>12</sub> alkenyl, C<sub>1</sub>-C<sub>12</sub> aralkyl, C<sub>1</sub>-C<sub>12</sub> alkaryl, C<sub>1</sub>-C<sub>12</sub> alkoxy and C<sub>1</sub>-C<sub>12</sub> hydroxyalkyl, and may contain one or more cleavable bonds, to form a derivatised polymer having the structure (XV)



b. reacting (XV) in a polymerisation reaction with between 0.01 and 100 unit equivalents of (VI) to form a polymer (XVI)



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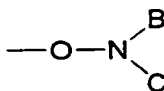
wherein  $1 \leq s \leq r$ .

32. A process according to claim 31 wherein (VII) is subsequently reacted with between 0.01 and 100 unit equivalents of reagent  $\text{HR}^x$ , wherein  $\text{R}^x$  is a solubility modifying group.

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33. A process according to claim 32, wherein  $\text{R}^x$  is a hydrophilic group selected from amino- $\text{C}_{1-12}$  alkyl, amino- $\text{C}_{1-12}$  dialkyl, amino- $\text{C}_{1-12}$  alkanol, preferably 1-amino-2-propanol.

34. A process according to claim 31 or 32, wherein step B is a Controlled Radical Polymerisation process, preferably one in which polymer of the structure (XV) has one terminal group A and one terminal group



35. The polymer as defined in any of claims 1 to 14, for use in a method of manufacture of a medicament, preferably for the treatment of cancer.

2.12.36. 37. A composition comprising a polymer as defined in any of claims 1 to 14 and a pharmaceutically acceptable excipient.

37.38. Use of a polymer as defined in any of claims 1 to 14 as an excipient.

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